AUTOMATIC CONTROL and COMPUTER SCIENCE Section

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Reflective online reconfiguration of real-time applications having tasks with static priorities
Corina Agrigoroaie, Lavinia Ferariu and Cătălin Brăescu

Full text

This paper addresses to online reflective reconfiguration of real time applications. Both periodic and aperiodic processes compliant with precedence constraints and real time constraints are accepted. The suggested approach is targeted at providing increased runtime predictability for the real time systems working with static priorities. Concerning this purpose, the reconfiguration algorithm performs online feasibility tests and lack/utilisation's evaluations, and triggers the commutation between predefined running scenarios, whenever excessive under-loading or unfeasible over-loading is detected. A specific formalism is introduced to describe the allowed reconfigurations. This formalism is also exploited within a software tool which permits a simple definition of all necessary data inputs and their automatic export to the real time system. The suggested reconfiguration is compatible with a very large range of applications. The design idea is illustrated for OSEK/VDX, by making use of the available tracing functions for time monitoring an on-line reconfiguration.

Key words: real time systems, embedded systems, static priorities, scheduling.

2010 Mathematics Subject Classification: 68M20, 68N25, 68W27, 93C95.

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Design of a Wavelet Based Data Mining Technique
Zobnin Boris, Sergei Yendiyarov and Sergei Petrushenko

In this article, we present wavelet based data mining technique (WBDMT), which can be used to extract useful features from a signal. This technique is based on the continuous wavelet transform (CWT). At the beginning of the article, we discuss a change-point detection algorithm based on the CWT. This change-point detection algorithm is used to extract local features from a signal. We call these features «regimes». Then we discuss a regime merging algorithm which we use to remove redundant regimes in order to extract only useful information from a signal.

Key words: wavelet transform, data mining, change-point, signal processing.

2000 Mathematics Subject Classification: 94A12, 97R40, 68T10, 91C20.

Ship Roll Stabilization via Sliding Mode Control and Gyrostabilizer
Hamed Haghighi and Mohammad Reza Jahed-Motlagh

Gyrostabilizers were introduced for reducing roll motion of ships many years ago. However, the very large size of traditional gyro stabilizers reduced their application. Today's enhancements in mechanical design and digital control systems brought back the gyrostabilizers into attention. This paper improves the performances of twin wheel gyro by nonlinear sliding mode control (SMC) method. The control strategy is robust and archives a stable system, opposing to wave perturbations. A comparison of the SM controller and a primary PD controller is realized. Simulation results are given to demonstrate the performances of the proposed controller.

Key words: sliding mode control, gyrostabilizer, roll motion

2000 Mathematics Subject Classification: 93C10

Network-Induced Time-Varying Delay Modeling for Compensation Through Predictive Control
Constantin F. Căruntu and Corneliu Lazăr

The goal of this paper is to provide a control design methodology that can assure the closed-loop performances of a physical plant, while compensating the time-varying delays introduced by the communication network that links the controller with the remote process. Firstly, the error caused by the time-varying delays is modeled as a disturbance and a method of bounding the disturbances is presented. Then, a robust one step ahead predictive controller based on flexible control Lyapunov functions is designed, which explicitly takes into account the bounds of the disturbances caused by time-varying delays and guarantees also the input-to-state stability of the system in a non-conservative way. Moreover, it is shown that by choosing an appropriately Lyapunov function, the MPC algorithm amounts solving a single, low-complexity linear program each sampling instant. The modeling method and the control strategy were tested on a vehicle drivetrain controlled through CAN, with the aim of damping driveline oscillations. Several TrueTime simulations based on realistic scenarios show that the proposed control scheme can handle the performance and physical constraints and the strict limitations on the computational complexity.

Key words: networked control systems, time-varying delays, predictive control, TrueTime simulation.

2000 Mathematics Subject Classification: 93C10, 93D05, 00A72.

Future Internet and ITIL For Intelligent Management in Industrial Robotics Systems
Adrian Chioreanu and Stelian Brad

Based on Future Internet and ITIL, cutting edge concepts and approaches related to software service systems in distributed architectures for managing information and processes in industrial robot platforms are introduced. A new approach in defining the business relation for entities that have various interests related to industrial robots, as well as tools that support the new business approach are also identified in this paper.

Keywords: Future Internet, ITIL, Industrial Robotic Systems.

2000 Mathematics Subject Classification: 68U35, 68M11.

A .Net Reinforcement Learning Platform for Multiagent Systems
Alexandra Constandache and Florin Leon

Reinforcement learning is a convenient way of allowing the agents to autonomously explore and learn the best action sequences that maximize their overall value, based on successive rewards received from the environment. Among other similar libraries and platforms, the reinforcement platform presented here is especially designed to be used with the .NET framework and provides a general support for developing solutions for reinforcement learning problems.

Key words: reinforcement learning, reinforcement learning platform, intelligent agents, benchmark problems.

2000 Mathematics Subject Classification: 68T99, 68N19.

Lithium-Ion Battery Test for Wireless Sensor Networks
George-Emil Vieriu

The widespread usage of Lithium-Ion battery in mobile devices (like phones, laptops, PDAs, etc.) led to lower prices, making them a popular choice for powering wireless sensor networks (WSN). In this paper the author propose a cheap and simple solution for choosing the best Lithium-Ion battery for WSNs. The general characteristics of Li-Ion batteries may not be enough for choosing the most suitable power source for wireless sensor networks' nodes due to the extremely low current consumption and long running operating times.

Key words: Lithium-Ion, battery, wireless sensor networks.

2010 Mathematics Subject Classification: 94C99